

ABSTRACT OF THE DISCLOSURE

5 The present invention improves the performance of microchannel systems for chemical and biological synthesis and analysis by providing a method and apparatus for producing a thin band of a species sample. Thin sample bands improve the resolution of microchannel separation processes, as well as many other processes requiring precise control of sample size and volume. The new method comprises a series of steps in which a species sample is manipulated by controlled transport through a junction formed at the intersection of four or
10 more channels. A sample is first inserted into the end of one of these channels in the vicinity of the junction. Next, this sample is thinned by transport across the junction one or more times. During these thinning steps, flow enters the junction through one of the channels and exists through those remaining, providing a divergent flow field that progressively stretches and thins the band with each traverse of the junction. The thickness of the resulting sample band
15 may be smaller than the channel width. Moreover, the thickness of the band may be varied and controlled by altering the method alone, without modification to the channel or junction geometries. The invention is applicable to both electroosmotic and electrophoretic transport, to combined electrokinetic
20 transport, and to some special cases in which bulk fluid transport is driven by pressure gradients. It is further applicable to channels that are open, filled with a gel or filled with a porous or granular material.

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